SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-45

Name: Sheridan Lake **County:** Pennington

Legal description: Sec. 11, 12, 13, 14; R5E; T1S and Sec. 7; R4E; T1S
Location from nearest town: 5 miles east and 2 miles north of Hill City, SD
Dates of present survey: May 23-25 and July 19-20, 2012
Date last surveyed: May 25-26 and July 18-19, 2011
Most recent lake management plan: F21-R-38 Date: 2006
Management classification: Warmwater permanent
Contour mapped: June 1986

Primary Species: (game and forage)	Secondary and other species:
1. Rainbow Trout	1. Northern Pike
2. Yellow Perch	2. Golden Shiner
3. Black Crappie	3. Green Sunfish
4. Largemouth Bass	4. White Sucker
5. Brown Trout	5. European Rudd
6.	6. Black Bullhead
7.	7. Rock Bass
8.	8. Channel Catfish

PHYSICAL CHARACTERISTICS

Surface Area: 383 acres **Watershed:** 95,311 acres
Maximum depth: 96 feet **Mean depth:** 30 feet
Lake elevation at survey: 4,633 ft. in May (near full)

Ownership of lake and adjacent lakeshore property

Sheridan Lake was constructed by the Civilian Conservation Corps for recreational purposes in 1939. Sheridan Lake and its dam are maintained and operated by the United States Forest Service (USFS). The operation and maintenance of campgrounds, picnic areas, parking lots, and boat launch facilities are managed under a special use permit by non-government entities. These entities also cooperate with the USFS during major maintenance and improvement in the off season. The marina and concession operations are leased to private enterprise under other long-term use permits (Personal communication with Amy Ballard, USFS, 1995).

Land use

The ownership of the Sheridan Lake watershed is 85.8% USFS (81,818 ac) and 14.2% private (13,493 ac) (Personal communication Jon Macy, USFS, 1994). The bulk of USFS land is managed for timber production, but is also grazed through a permit process. Most of this land is covered by pine or spruce forest interspersed with meadows. Logging, thinning, and other timber management practices are ongoing. All of these activities contribute to the sediment load into Sheridan Lake carried by Spring and Horse Creeks. Private land is less often forested and more often used as horse pasture, cattle grazing land, home sites, or campgrounds. The

watershed also contains the town of Hill City and several other small developments. Small reservoirs including Mitchell, Major, Newton Fork and several unnamed farm ponds are located within the watershed. Most of the watershed consists of hills with moderate to steep inclines. Roads and trails are prevalent throughout the watershed.

Fishing Access

Sheridan Lake has boat launches on the north and south ends of the lake. Shore fishing is accessible via roads at both locations with floating fishing docks in both locations. Several floating docks are also located at a parking lot off of SD Hwy 385 on the west end of the lake. This area was renovated in the fall of 2012 to include a concrete stairway, ADA accessible ramp to the fishing piers and ice fishing access. Improvements were also made to the south boat ramp at the same time.

Observations of Water Quality and Aquatic Vegetation

Abundant emergent vegetation, primarily cattails, is present in the shallow ends of bays, along shallow shoreline areas, and near the inlets of Spring and Horse Creeks. Submergent vegetation is abundant throughout the lake at depths of six to eight feet. Algae blooms sometimes occur during the summer months and filamentous algae is found at times along the shoreline. Sheridan Lake is also infested with curly leaf pond weed which fills some bays.

Siltation occurs at all inlets, especially the Spring Creek and Horse Creek inlets, and is caused by agricultural use (grazing), timber/logging operations, highway runoff, and natural erosion.

Observations on condition of structures, (i.e. spillway, level regulators, boat ramps, etc.)

A faulty valve in the dam prevented controllable water releases from Sheridan Lake into Spring Creek during 2003. This valve was repaired in late 2004 and attempts were made to open the valve in 2011, but is not operational at this time. Game, Fish, and Parks and the USFS is continuing to work to have the valve operational in the future.

CHEMICAL DATA

No chemical data was collected in 2012. Previous water quality monitoring surveys show that Sheridan Lake does oxygen and temperature stratify. Dissolved oxygen levels likely limit the habitat of fish species to the upper reaches (<15 ft) of the lake during the summer.

MANAGEMENT OBJECTIVES

Objective 1. Maintain a mean gill net CPUE of stock-length Yellow Perch equal to or greater than 20, a PSD of 30-60.

Objective 2. Maintain a secondary fishery of Rainbow Trout through stocking catchable size fish.

Objective 3. Maintain a Largemouth Bass population with a minimum nighttime boat electrofishing CPUE for stock-length and longer fish equal to or greater than 40, PSD range between 40 and 70, and a PSD-P equal to or greater than 10.

Objective 4. Maintain a Smallmouth Bass population with a minimum nighttime boat electrofishing CPUE for stock-length fish of 20, PSD range between 40 and 70, and a PSD-P equal to or greater than 10.

BIOLOGICAL DATA

Sampling Effort

Three modified fyke (trap) nets consisting of a 1.3 X 1.5 m frame, 19.1 mm (0.75 in) mesh and a 1.2 X 23 m (3.9 X 75.5 ft) lead were set on May 23, and five additional trap nets were set on May 24, 2012 (Table 1, Figure 1). Trap nets have been set in similar locations during previous surveys with six to eight nets set. In 2011 and 2012 trap net surveys were conducted in May and not July as in previous years. On July 19, 2012 water column parameter data was collected using a YSI meter. Two experimental gill (gill) nets (45.7 m [150 ft] long and 1.8 m [6 ft] deep with six 7.6 m [25 ft] panels of bar mesh sizes: 12.7 mm [0.5 in], 19.1 mm [0.75 in], mm [1.25 in], 38.1 mm [1.5 in], and 50.8 mm [2.0 in]) were then set in locations similar to previous years, but at approximately 15 ft depth (Table 1, Figure 1). This was determined to be the depth where oxygen dropped below a habitable level. All nets remained in the water overnight for a total of eight trap net and two gill net nights.

Nighttime boat electrofishing was conducted at Sheridan Lake on June 12, 2012 to sample Largemouth and Smallmouth Bass. Four ten minute sites were completed. Due to equipment malfunction, two sites were skipped. In the past, six 10-minute sites were completed in September, but sampling was moved to late spring in 2011 and 2012 on recommendations from studies conducted at South Dakota State University.

Table 1. Date, net number (net #), latitude and longitude for experimental and modified fyke nets during the fisheries survey of Sheridan Lake, Pennington County, South Dakota, 2012.

Set Date	Net #	UTM Lat	UTM Long
7/18	Gill 1	4870356	622353
7/18	Gill 2	4869714	622007
5/24	Trap 1	4869240	623520
5/24	Trap 2	4869257	623458
5/24	Trap 3	4869603	622765
5/24	Trap 4	4869722	622580
5/23	Trap 5	4869666	621977
5/23	Trap 6	4869471	621708
5/24	Trap 7	4870662	622060
5/23	Trap 8	4870921	622653

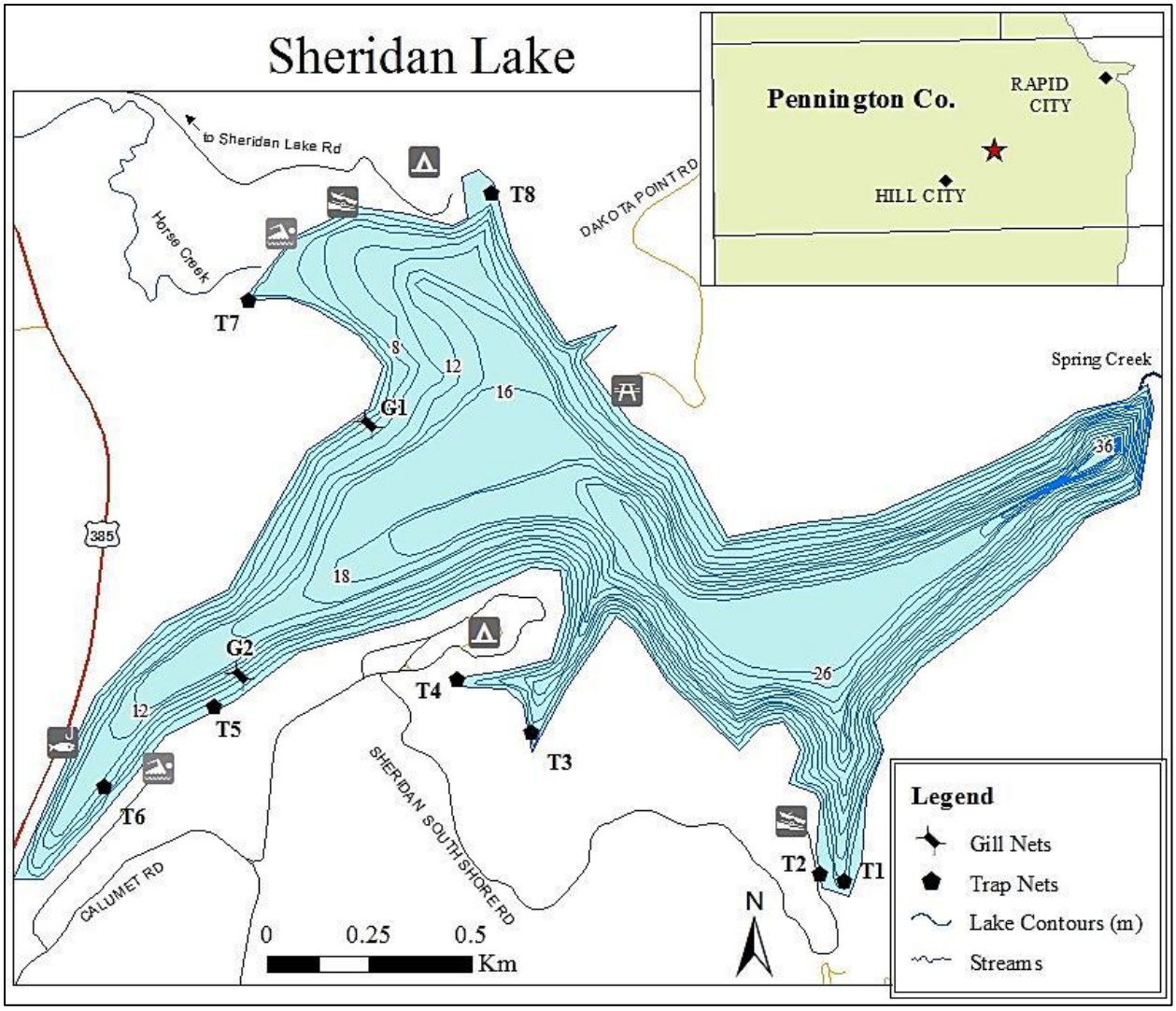

Figure 1. Lake map and locations of experimental gill and modified fyke nets during the fisheries survey for Sheridan Lake, Pennington County, South Dakota, 2012.

Results and Discussion

Eleven fish species were collected in trap nets, totaling 222 fish (Table 2). Rock Bass, and Yellow Perch were the most numerous species sampled in trap nets. This lower catch may be due to survey timing, weather or a number of other factors. The Black Hills experienced a warm, dry winter and spring, but the 2 days of this survey were cold and rainy which could have affected the catch. Seven species were collected in gill nets, with Yellow Perch making up the majority (92.7%) of the catch (Table 3).

Table 2: Species, number captured (N), catch per unit effort (CPUE and CPUE-S), proportional stock densities (PSD and PSD-P) and relative weight of stock length or greater fish (*Wr*>S) for all species collected in eight modified fyke nets in Sheridan Lake, Pennington County, South Dakota, May 24-25, 2012. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr*>S with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	*Wr*≥S
Black Bullhead	6	0.75 (0.4)	0.75 (0.4)	100	83 (33)	100.3 (10.2)
Black Crappie	11	1.4 (0.6)	1.4 (0.6)	100	0	97.0 (1.4)
Golden Shiner	11	1.4 (1.6)	-	-	-	-
Green Sunfish	2	0.2 (0.2)	0.2 (0.2)	100	0	110 (0)
Largemouth Bass	1	0.1 (0.2)	0	0	0	98*
Northern Pike	4	0.5 (0.4)	0.5 (0.4)	0	0	85.5 (14.6)
Rainbow Trout	1	0.1 (0.2)	0.1 (0.2)	100	0	90.7
Rock Bass	116	14.5 (7.7)	14.3 (7.7)	33 (7)	17 (6)	94.2 (0.3)
European Rudd	15	1.9 (1.4)	1.9 (1.4)	93 (11)	73 (20)	-
White Sucker	5	0.6 (0.4)	0.6 (0.4)	100	100	92.0 (3.6)
Yellow Perch	50	6.3 (3.9)	6.3 (3.9)	48 (12)	6 (6)	94.1 (1.1)
Total	222	27.8				

**Wr* for substock fish

Table 3: Species, number captured (N), catch per unit effort (CPUE and CPUE-S), proportional stock densities (PSD and PSD-P) and relative weight of stock length or greater fish (*Wr*>S) for all species collected in two experimental gill nets set in Sheridan Lake, Pennington County, South Dakota, July 20, 2012. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr*>S with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	*Wr*≥S
Black Crappie	1	0.5 (1.5)	0	0	0	-
Northern Pike	2	1 (0)	1 (0)	100	50 (50)	95.6
Rainbow Trout	3	1.5 (1.5)	1.5 (1.5)	67 (33)	0	80.9 (12)
Rock Bass	5	2.5 (6.6)	1.5 (4.6)	0	0	91.9 (11)
Smallmouth Bass	2	0 (0)	0.5 (1.5)	0	0	92.9
White Sucker	4	2 (3)	2 (3)	100	100	95.6 (5.1)
Yellow Perch	219	109.5 (60)	108 (55)	79 (4)	11 (3)	105.9 (0.3)
Total	236	118				

Largemouth bass

During nighttime boat electrofishing, 113 Largemouth Bass were captured, resulting in a catch per unit effort (CPUE) of 169 fish per hour (Table 4). Largemouth Bass relative weight of stock length or greater fish (*Wr*>S) improved from 98 in 2011 to 105 in 2012.

The proportion of quality length fish has also increased since the 2011 sample with a proportional stock density (PSD) of 42. Proportional stock density of preferred length fish declined slightly from 10 in 2011 to 6 in 2012. Length-frequency histograms show a slight increase in size with a few fish still above 380 mm (Figure 2). The highest abundances are between 240 and 350 mm.

Aging of Largemouth Bass from the 2012 survey indicated most were four to six years old (Table 5). Growth in 2011 and 2012 was estimated as slightly slower than past surveys. Largemouth Bass growth continues to fall short of the South Dakota and Region 1 (western SD) mean (Figure 3) (Willis et. al 2001). For example, Largemouth Bass in Sheridan Lake are reaching stock length (200 mm or 8 in) at about three to four years of age; whereas the statewide average is they reach this at two to three years.

Table 4. Year, number captured, pedal time in seconds, catch per unit effort (CPUE and CPUE-S), proportional stock densities (PSD and PSD-P) and relative weight of stock length or greater fish (*Wr*>S) for Largemouth Bass collected during nighttime boat electrofishing of Sheridan Lake, Pennington County, South Dakota, 2011-2012.

Year	N	Time (sec)	CPUE	CPUE-S	PSD	PSD-P	*Wr*≥S
2011	52	3,676	52 (19)	50 (19)	34 (11)	10 (7)	98
2012	113	2,400	169 (50)	152 (59)	42 (9)	6 (4)	105

Table 5. Year, age, Length (mm) at Age (yr) and statewide regional averages for Largemouth bass collected by nighttime boat electrofishing in Sheridan Lake, Pennington County, South Dakota, 2012.

Age →			1	2	3	4	5	6	7	8	9
Year	Age	N									
2010	2	9	73	137							
2009	3	4	65	125	158						
2008	4	29	58	114	180	227					
2007	5	27	69	130	188	235	272				
2006	6	29	65	114	167	228	269	301			
2005	7	13	70	112	172	220	257	296	321		
2003	9	2	69	100	136	195	270	307	331	347	360
Population mean 2012			67	119	167	221	267	302	326	347	360
Population mean 2011			64	114	174	230	271	314	347	380	425
Population mean 2010			70	140	204	272	322	351	381	412	
Statewide mean			96 (3)	182 (6)	250 (7)	305 (8)	342 (8)				
Region 1 mean			78 (4)	154 (10)	214 (11)	272 (13)	318 (13)				

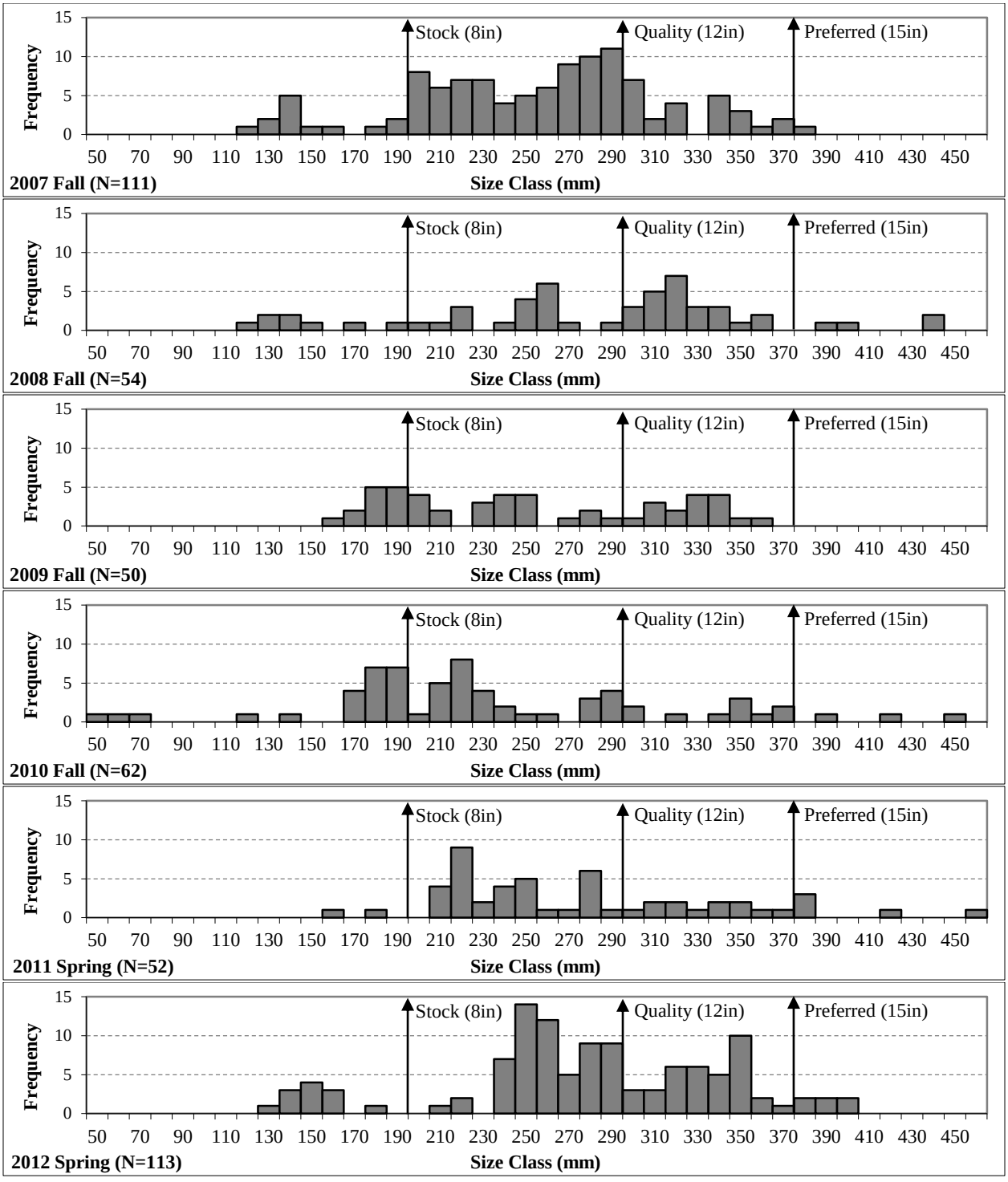

Figure 2. Length frequency histograms for Largemouth Bass collected by nighttime boat electrofishing in Sheridan Lake, Pennington County, South Dakota, 2012.

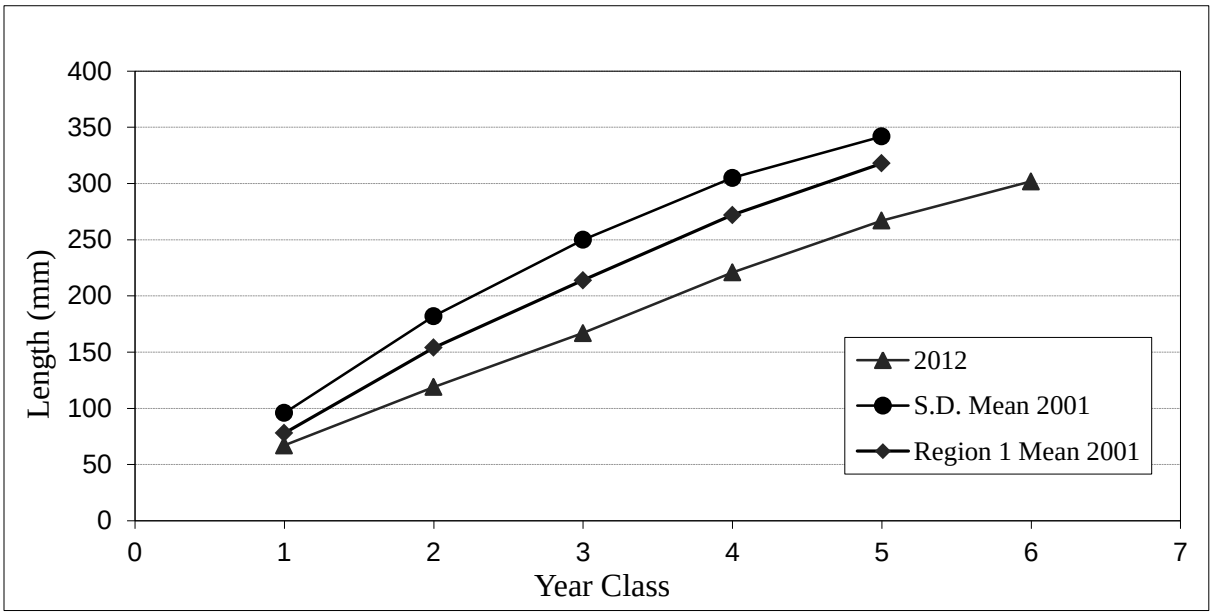

Figure 3. Mean length-at-age for Largemouth Bass captured by nighttime boat electrofishing in Sheridan Lake, Pennington County, South Dakota, 2012, plotted with the South Dakota mean and Region 1 (western South Dakota) mean.

Yellow Perch

Yellow Perch are the primary species targeted and caught by anglers in Sheridan Lake, especially in the winter (Simpson 2011). Until the 2011 survey, gill net CPUE of Yellow Perch showed an overall decrease since 2006 (Table 6). Abundance increased in 2012 with a CPUE of 110. One possible reason for this is that gill nets may have been set deeper than the optimal oxygen levels in recent years prior to 2011.

From 2007 to 2010, size structure of Yellow Perch remained similar but decreased in 2011 and, although still high, was at a value of 79 in 2012 (Table 6). Proportions of preferred length fish (PSD-P) were similar to other years, but about half of what they were in 2008 and 2009. Yellow Perch *Wr*≥S for individuals collected in gill nets has been high and remained stable in 2012 at 105.9.

The length frequency histogram from 2012 (Figure 4) is similar to 2011 but with one visible year class mode instead of two. Most Yellow Perch in Sheridan Lake are around quality length with a peak around 220 mm (8.6 in). Several year classes appear to present (See age discussion below).

Otoliths were taken from a subsample of Yellow Perch collected in gill nets in 2012 (Table 7). A majority of fish were aged at three to six years old, indicating a young population. Some Sheridan perch do exhibit faster growth reaching quality length (200 mm or 8 in) around age-3. This is similar to South Dakota scale aged mean back-calculated length-at-age but faster than the Region 1 (Western South Dakota) mean (Willis et. al, 2001). It appears that some older perch exist in Sheridan Lake. In 2010, a 247 mm (9.7 in) fish was aged at 12 and a 230 mm (9 in) fish was aged at 14; and in 2012 a 292 mm (11.5 in) fish was aged at 11.

High fishing pressure and harvest may be contributing to yellow perch being “cropped off” when they reach a certain size. Yellow Perch size structure may be being altered by high rates of harvest of larger sized individuals. A winter creel census was completed in 2010-2011 and estimated that anglers harvested around 7,700 perch in Jan-March. This was a substantial decrease from the over 20,000 estimated harvest during the same time in 2007 (Simpson 2011).

Table 6. Species, number captured (N), catch per unit effort (CPUE and CPUE-S), proportional stock densities (PSD and PSD-P) and relative weight of stock length or greater fish (*Wr*>S) for Yellow Perch collected in experimental gill nets in Sheridan Lake, Pennington County, South Dakota, 2012. CPUE’s with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr*>S with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P	*Wr*>S
2000	205	102.5	102.5	80	3.4	104
2003	147	74	73.5	75	5	102
2004	231	116	116	81	7	98
2005	89	44.5	44.5	83	8	97.4
2006	193	96.5	71	78	1	98.8
2007	54	27	27	93	11	96
2008	92	46	46	98	20	100
2009	21	10.5	10.5	100	24	100
2010	14	3.5	3.5	93	14	104
2011	148	74 (0)	74 (2)	74 (8)	10 (4)	102 (1)
2012	219	110 (60)	108 (55)	79 (4)	11 (3)	106 (0)

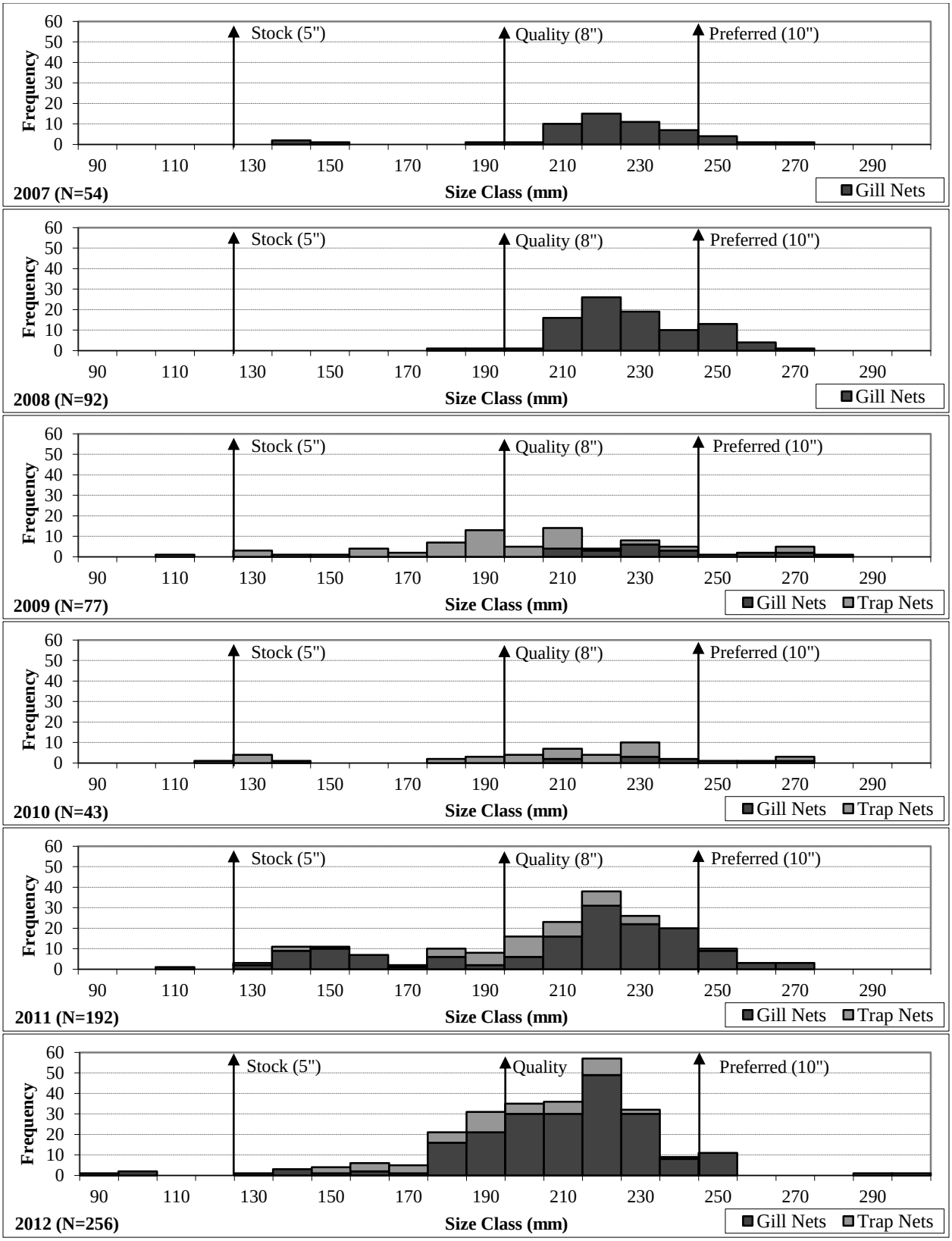

Figure 4. Length frequency histograms for Yellow Perch collected in experimental gill (gill nets) and modified fyke (trap nets) nets during fisheries surveys in Sheridan Lake, Pennington County, South Dakota, 2007-2012.

Table 7. Age, minimum and maximum total length and weighted mean total lengths (mm) for Yellow Perch caught in experimental gill nets during the 2012 fishery survey of Sheridan Lake, Pennington County, South Dakota, including Region 1 and Statewide average mean total lengths by age (Willis et al. 2001).

Age	Minimum	Weighted Mean	Maximum	N	Region 1 Mean	S. Dakota Mean
2	141	150	162	4	117	145
3	163	205	221	12	158	190
4	179	212	238	14	186	220
5	218	241	267	10	208	242
6	224	239	271	10	-	-
7	272	272	272	1	-	-
11	292	292	292	1	-	-

Black Crappie

Black Crappie is a species targeted by anglers at Sheridan Lake (Simpson 2011). Similar to other species, lower sample sizes were observed in 2012 than in 2011 with eleven captured in trap nets for a mean CPUE of 1 (Table 2). All fish were between quality and preferred length (200-250 mm or 8-10 in) and condition was good with a mean *Wr*≥S of 100.

Rainbow Trout

Only one Rainbow Trout was captured in trap nets (Table 2) and three in gill nets during the 2012 survey (Table 3). Sheridan Lake was stocked with 10,285 catchable rainbow trout prior to the survey in 2012. However, these stockings occurred in April and May, over two months prior to the survey.

Rock Bass

Rock Bass were the most abundant species captured in trap nets during the survey (Table 2). The established population is likely a result of an unauthorized stocking.

European Rudd

European Rudd, another introduced species, was captured in much lower abundance in 2012 (Table 2). European Rudd may pose a threat to the Sheridan Lake system because of their omnivorous habits, which may result in predation on other fishes and competition for resources (Howells et al. 1991).

Smallmouth Bass

In 2011 and 2012, 200 and 285 Smallmouth Bass adults were stocked into Sheridan Lake, respectively. Also, 7,800 and 5,600 fingerlings were stocked in August 2010 and 2011, respectively. Only two individuals were sampled in gill nets (Table 3). None were caught during the electrofishing survey.

Northern Pike

Four Northern Pike were caught in trap nets and two were sampled in gill nets (Tables 2 and 3).

Other Species

Black Bullhead, Golden Shiner, Green Sunfish, and White Sucker were also collected during the fisheries survey (Tables 1 and 2).

RECOMMENDATIONS

1. Continue stocking Rainbow Trout at current stocking rate.

2. Conduct annual lake survey in 2013.
    a. Trap netting to be conducted in early summer as better suited for pan fish catches.
    b. Gill net sampling should be completed during late summer. YSI water chemistry profiles should be taken prior to net placement.
    c. Conduct night electrofishing during the spring for largemouth bass and smallmouth bass.

LITERATURE CITED

Howells, R. G., R. W. Luebke, B. T. Hysmith, J. H. Moczygemba. 1991. Field Collections of Rudd, Scardinius erythrophthalmus (Cyprinidae), in Texas. The Southwestern Naturalist, 36:244-245

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Willis, David W. Daniel A. Isermann, Matthew J. Hubers, Bruce A. Johnson, William H. Miller, Todd R. St. Sauver, Jason S. Sorensen, and Eric G. Unkenholz. 2001. Growth of South Dakota Fishes: A Statewide Summary with Means by Region and Water Type. South Dakota Game, Fish and Parks Special Report. Pierre, SD.

APPENDIX

Appendix A. Year, species and strain, size, number of stockings and number stocked for fish stocked into Sheridan Lake, Pennington County, South Dakota, 2005-2012.

Year	Species (Strain)	Size	Stockings	Number
2005	Brown Trout (Soda Lake)	Catchable	1	2,664
	Rainbow Trout (Ennis)	Catchable	2	5,000
	Rainbow Trout (McConaughy)	Catchable	2	10,700
2006	Rainbow Trout (Erwin)	Catchable	2	5,000
	Rainbow Trout (Shasta)	Catchable	2	10,789
2007	Brown Trout (Soda Lake)	Catchable	1	726
	Rainbow Trout (Erwin)	Catchable 11”	2	4,100
	Rainbow Trout (Shasta)	Catchable	2	7,490
2008	Rainbow Trout (Shasta)	Catchable 11"	1	3,582
	Rainbow Trout (Utah)	Catchable	1	5,000
2009	Brown Trout (Utah)	Catchable 11"	1	1,000
	Rainbow Trout (Erwin)	Catchable	1	10,000
	Rainbow Trout (McConaughy)	Catchable	3	10,637
	Rainbow Trout (McConaughy)	Fingerling	1	6,000
2010	Brown Trout (Soda Lake)	Catchable 11"	1	900
	Rainbow Trout (Erwin X Arlee)	Catchable	1	9,000
	Rainbow Trout (McConaughy)	Catchable	2	9,630
	Smallmouth Bass	Fingerling	1	7,800
2011	Rainbow Trout (Erwin X Arlee)	Catchable	1	7,920
	Rainbow Trout (McConaughy)	Catchable	2	9,630
	Rainbow Trout (Shasta)	Fingerling	1	7,933
	Smallmouth Bass	Adults	1	200
	Smallmouth Bass	Fingerling	1	5,600
2012	Rainbow Trout (Erwin X Arlee)	Catchable	1	9,000
	Rainbow Trout (McConaughy)	Catchable	2	10,000
	Smallmouth Bass	Adults	1	285